

WHAT IS CLAIMED IS:

1. A method of fabricating a module for at least partially intercepting a light beam propagating along a beam path, the method comprising:

5 providing a single crystal silicon substrate with a first substrate surface and a second substrate surface;

forming a reflector support layer on the first substrate surface;

10 forming a support frame and at least one reflector by etching the substrate from the second substrate surface;

forming at least one electrical conduit on the reflector support layer; and

15 forming a reflector support by etching the reflector support layer from the first substrate surface, the reflector support mechanically coupled to the support frame and the reflector, the reflector support movable such that the reflector is movable substantially perpendicularly to the first substrate surface.

2. The method of Claim 1, wherein the first substrate surface has a {110}

15 crystallographic orientation.

3. The method of Claim 1, wherein the first substrate surface has a {100} crystallographic orientation.

4. The method of Claim 1, further comprising forming alignment marks on the first and second substrate surfaces.

5. The method of Claim 1, wherein forming a reflector support layer on the first substrate surface comprises:

forming a silicon dioxide layer on the first substrate surface; and

forming a substratum layer on the silicon dioxide layer.

6. The method of Claim 5, further comprising forming an insulating layer on the substratum layer.

7. The method of Claim 6, wherein the insulating layer comprises silicon nitride.

8. The method of Claim 5, wherein forming a substratum layer comprises forming a protective layer on the silicon dioxide layer and forming a polycrystalline silicon layer on the protective layer.

9. The method of Claim 8, wherein the protective layer comprises silicon nitride.

10. The method of ~~Claim 5~~ B, wherein forming a substratum layer comprises forming a polycrystalline silicon layer on the silicon dioxide layer.

5 11. The method of Claim 1, wherein forming a support frame and at least one reflector by etching the substrate from the second substrate surface comprises:

forming an etch-resistant layer on the second substrate surface;

10 patterning the etch-resistant layer on the second substrate surface to selectively expose a first region of the second substrate surface and to maintain the etch-resistant layer on a second region of the second substrate surface;

15 etching the substrate from the first region of the second substrate surface to the reflector support layer, thereby forming sidewalls of the support frame and at least one reflective surface of the reflector; and

removing the etch-resistant layer from the second region of the second substrate surface.

12. The method of Claim 11, wherein etching the substrate from the first region of the second substrate surface comprises performing a deep reactive ion etch.

13. The method of Claim 12, wherein etching the substrate from the first region of the second substrate surface further comprises performing an anisotropic wet etch subsequently to the deep reactive ion etch.

14. The method of Claim 11, wherein the etch-resistant layer comprises silicon dioxide.

15. The method of Claim 11, wherein the reflector support layer comprises a silicon dioxide layer on the first substrate surface and a substratum layer on the silicon dioxide layer, and wherein forming a support frame and at least one reflector further comprises removing the silicon dioxide layer from a portion of the reflector support layer corresponding to the first region of the substrate.

20 16. The method of ~~Claim 11~~ B, wherein forming a support frame and at least one reflector further comprises forming a metal layer on the reflective surface of the reflector.

30 17. The method of Claim 16, wherein the metal layer comprises aluminum.

18. The method of Claim 16, wherein forming a metal layer comprises forming an adhesion layer on the reflective surface of the reflector and forming a gold layer on the adhesion layer.

5 19. The method of ~~Claim 18~~ wherein the adhesion layer comprises chromium.

20. The method of ~~Claim 18~~, wherein the adhesion layer comprises titanium.

21. The method of Claim 1, wherein forming at least one electrical conduit on the reflector support layer comprises:

10 forming a first metallic layer on the reflector support layer;

15 patterning the first metallic layer, thereby forming a first portion of the electrical conduit;

20 forming an insulating layer on the first metallic layer;

25 patterning the insulating layer, thereby forming at least one via holes to the first portion of the electrical conduit;

30 forming a second metallic layer on the insulating layer;

35 patterning the second metallic layer, thereby forming a second portion of the electrical conduit, the second portion of the electrical conduit being conductively coupled to the first portion of the electrical conduit through the via holes of the insulating layer.

40 22. The method of Claim 21, wherein the first metallic layer and second metallic layer each comprise a chromium layer and a gold layer.

45 23. The method of Claim 21, wherein the insulating layer comprises silicon dioxide.

50 24. The method of Claim 1, wherein the first portion and second portion of the electrical conduit each have a generally spiral configuration.

55 25. A method of fabricating a module for at least partially intercepting a light beam propagating along a beam path, the method comprising:

60 providing a substrate comprising single crystal silicon, a first substrate surface, a second substrate surface, and an etch stop layer below the first substrate surface;

65 providing a reflector support layer comprising the etch stop layer;

5 forming a support frame and at least one reflector by etching the substrate from the second substrate surface to the etch stop layer;

10 forming at least one electrical conduit on the reflector support layer; and

15 forming a reflector support by etching the reflector support layer from the first substrate surface, the reflector support mechanically coupled to the support frame and the reflector, the reflector support movable such that the reflector is movable substantially perpendicularly to the first substrate surface.

20 26. The method of Claim 25, wherein the etch stop layer comprises a boron diffusion layer.

25 27. The method of Claim 26, wherein providing the reflector support layer further comprises forming an epitaxial silicon layer on the first substrate surface.

30 28. The method of Claim 25, wherein the substrate comprises a silicon-on-insulator wafer, and the etch stop layer comprises silicon dioxide.

35 29. The method of Claim 25, wherein providing the reflector support layer further comprises forming an insulating layer on the first substrate surface.

40 30. The method of Claim 29, wherein the insulating layer comprises silicon nitride.

45 31. A method of fabricating a device on a substrate, the device comprising at least one fragile component, the method comprising:

50 providing the substrate;

55 forming the device on the substrate;

60 forming a conformal layer on the device by depositing a polymeric material in a vapor phase onto the substrate;

65 25 dicing and separating the substrate into a plurality of chips, at least one chip containing the device, the conformal layer providing structural support for the fragile component of the device; and

70 30 removing the conformal layer from the device subsequently to dicing the substrate into the plurality of chips.

75 32. The method of Claim 31, wherein the device is a micro-electro-mechanical-system device.

33. The method of Claim 31, wherein the polymeric material comprises para-xylylene monomers.

34. A method of fabricating a module for at least partially intercepting a light beam propagating along a beam path, the method comprising:

5 providing a single crystal silicon substrate with a first substrate surface and a second substrate surface;

10 forming a reflector support layer on the first substrate surface;

15 forming a support frame and at least one reflector by etching the substrate;

15 forming at least one electrical conduit on the reflector support layer;

20 forming a conformal layer by depositing a polymeric material in a vapor phase onto the substrate from the second substrate surface; and

25 forming a reflector support by etching the reflector support layer, the reflector support mechanically coupled to the support frame and the reflector, the reflector support movable such that the reflector is movable substantially perpendicularly to the first substrate surface.

35. The method of Claim 34, wherein forming the reflector support is performed subsequently to forming the conformal layer, whereby the conformal layer protects the reflector from the etching of the reflector support layer.

36. The method of Claim 34, further comprising:

20 dicing and separating the substrate into a plurality of chips; and

25 removing the conformal layer subsequently to dicing the substrate, whereby the conformal layer provides structural support for the reflector support during the dicing of the substrate.

37. The method of Claim 34, wherein the polymeric material comprises para-xylylene monomers.